



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 10/775,748 | 02/10/2004 | Klaus Goller | 1890-0054 | 8728 |

7590 04/05/2007
Maginot, Moore & Beck LLP
Chase Tower
Suite 3250
111 Monument Circle
Indianapolis, IN 46204-5109

| |
|----------|
| EXAMINER |
|----------|

KALAM, ABUL

| | |
|----------|--------------|
| ART UNIT | PAPER NUMBER |
|----------|--------------|

2814

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|--|------------|---------------|
| 3 MONTHS | 04/05/2007 | PAPER |

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/775,748

Applicant(s)

GOLLER ET AL.

Examiner

Abul Kalam

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 December 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Status of Application

1. In the amendments filed on filed on December 28, 2006, claim 12 was amended, and new claims 21-29 were added. Thus, claims 12-29 are currently pending in the application.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. **Claims 12, 14-17 and 19-21, 23-26, 28 and 29** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pasch et al. (US 6,239,491; previously cited)** in view of **Shields et al. (US 6,087,724; previously cited)**.

With respect to **claims 12 and 21**, **Pasch** teaches (**FIG. 3**) an arrangement for contacting terminals of a substrate (**2**) comprising:

a substrate surface, a first terminal (**10**) having a first terminal surface, and a second terminal (**14**) having a second terminal surface, the first terminal surface being located at a shorter distance from the substrate surface than the second terminal surface (**FIG. 3**), the arrangement comprising:

a first insulating layer (**130**) on the substrate surface, having an insulation-layer surface being located at a longer distance from the substrate (**2**) surface than the

second terminal (14) surface, wherein a part of said first insulating layer is arranged between the first and the second terminal (FIG. 3).

a second insulating layer (150) arranged on the first insulating layer (130) (FIG. 3); wherein the first insulating layer (130) has a contact via (132) which extends from the insulation-layer surface to the first terminal (10) surface and is filled with a first conductive material ("tungsten") (FIG. 3; col. 7, Ins. 42-46);

wherein the second insulating layer (150) has a first recess (152), the first recess penetrating the second insulating layer and extending to the first conductive material (FIG. 3) (FIG. 3; col. 7, Ins. 55-67); and

wherein a second recess (134, 154) extends to the second terminal surface (14) through the first and second insulating layers (130, 150), and is filled with a third conductive material (FIG. 3; col. 7, Ins. 42-67).

Thus, **Pasch** teaches all the limitations of the claims, as set forth above, with the exception of disclosing: wherein the first recess extends into the first insulating layer and is filled with a second conductive material, such that the second conductive material contacts the first conductive material on a top surface and on a portion of a side surface thereof.

However, **Shields** teaches (FIG. 7) an arrangement for contacting terminals on a substrate wherein a first recess (62), penetrating the second insulating layer (65) and extending to the first conductive material (61A) and into the first insulating layer (63), is filled with a second conductive material (66; col. 6, Ins. 55-59), such that the second conductive material contacts the first conductive material (61A) on a top surface (161A)

Art Unit: 2814

and on a portion of a side surface (**261A**) thereof (**col. 6, Ins. 15-65**). Shield's invention is applicable to the production of various types of semiconductor devices, which exhibit high speed characteristics and improved reliability (**col. 7, Ins. 26-38**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention, to modify the structure of **Pasch** with the teaching of **Shields**, for the well known purpose of forming low resistance vias, which improves the reliability and performance of interconnection structures in semiconductor devices.

Regarding the limitations of "integrally-formed" in claim 12, and "a single step of filling," in claim 21, both limitations are product by process limitations and thereby given no patentable weight. Note that a "product by process" claim is directed to the product per se, no matter how actually made. *In re Thorpe et al.*, 227 USPQ 964, (CAFC, 1985) and the related case law cited therein which makes it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not.

As stated in Thorpe:

Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935);

Note that Applicant has burden of proof in such cases as the above case law makes it clear.

Furthermore, even if the limitations of “integrally-formed” and “single step of filling” were given patentable weight, the limitation of integrally-formed would still have been obvious since it has been held that forming in one piece of an article which has formerly been formed in two pieces and put together involves only routine skill in the art, *Howard v. Detroit Stove Works*, 150 U.S. 164 (1893). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to integrally form the third conductive material of Pasch because the same effects of providing electrical contacts would result.

With respect to **claims 14 and 23**, Pasch teaches wherein the first terminal (10) is one of a source terminal and a drain terminal, and the second terminal is a gate terminal (14) of a field-effect transistor (col. 7, Ins. 30-33).

With respect to **claims 15 and 24**, Pasch teaches wherein the first terminal (10) is one of a source terminal and a drain terminal of a field-effect transistor (col. 7, Ins. 30-33).

With respect to **claims 16, 17, 25 and 26**, Pasch teaches wherein a the first conductive material is tungsten (col. 7, Ins. 42-46).

With respect to **claims 19 and 28**, Pasch teaches (FIG. 3) wherein the second conductive material is conductively connected (via 152) to first conductive material and forms a first contact terminal, and wherein the third conductive material is conductively connected (vias 154, 134) to the second terminal (14) and forms a second contact terminal (col. 7, Ins. 42-67).

3. **Claims 13, 18, 22 and 27** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Pasch et al. ('491; previously cited)** and **Shields et al. (US '724; previously cited)**, as applied above to claims 12 and 21, respectively, and further in view of **Broekaart et al. (US 2001/0046784; previously cited)**.

With respect to **claims 13 and 22**, **Pasch and Shields** teaches all the limitations of the claim, as set forth above in claims 12 and 21, respectively, with the exception of disclosing:

The first terminal is one of a base terminal and a collector terminal, and the second terminal is an emitter terminal, arranged on a stack, of a bipolar transistor.

However, **Broekaart** teaches (**FIG. 1**) an arrangement for contacting terminals (**3, 4, 5**) of a substrate (**1**), wherein the first terminal is one of a base terminal and the second terminal is an emitter terminal, arranged on a stack, of a bipolar transistor (**pg. 1, [0015]**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the structure of **Pasch and Shields** with the teaching of **Broekaart**, because applying an interconnection structure to semiconductor devices such as MOSFET's or bipolar transistors would have been considered a mere substitution (**pg. 1, [0015]**) of art recognized equivalent devices (MPEP 2144.06).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt*

Art Unit: 2814

152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Lindle Air Products Co.* 85 USPQ 328 (USSC 1950).

With respect to **claims 18 and 27, Pasch and Shields** teaches all the limitations of the claim, as set forth above in claims 12 and 21, respectively, with the exception of disclosing:

wherein at least one of the second and third conductive materials is copper.

However, **Broekaart** teaches (**FIG. 1**) an arrangement for contacting terminals (**3, 4, 5**) of a substrate (**1**), wherein the second conductive material (**18**) comprises copper (**pg. 3, [0024]**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the structure of **Pasch and Shields** with the teaching of **Broekaart**, because substitution of art recognized equivalent materials, such as copper and tungsten (**pg. 3, [0024]**), which are well known conductive materials used to fill vias, would have been obvious to one of ordinary skill in the art of semiconductor devices (MPEP 2144.06).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Lindle Air Products Co.* 85 USPQ 328 (USSC 1950).

Response to Arguments

4. Applicant's arguments with respect to claims 12-29, filed on December 28, 2006, have been considered but are not persuasive.

Applicant argues that the Pasch reference does not teach the limitation of "an integrally formed third conductive material," recited in claim 12, and the limitation of "wherein the third conductive material is formed in a single step of filling," recited in claim 21. These arguments are not persuasive because the limitations are considered product by process limitations, which are not given patentable weight.

Note that a "product by process" claim is directed to the product per se, no matter how actually made. *In re Thorpe et al.*, 227 USPQ 964, (CAFC, 1985) and the related case law cited therein which makes it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. As stated in Thorpe:

Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935);

Note that Applicant has burden of proof in such cases as the above case law makes it clear.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Abul Kalam whose telephone number is 571-272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.


PHAT X. CAO
PRIMARY EXAMINER